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# A NOTE ON THE ADAPTIVE SIGNIFICANCE OF THE SPERM-HEAD IN CEREBRATULUS.

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While studying the fertilization processes in the living eggs of *Cerebratulus lacteus* at South Harpswell, Me., I was struck by the fact that it took the spermatozoa considerable time and not a little effort to bore through the thick membranes in order to reach the egg. From this I concluded that the long, slender and slightly curved head of the spermatozoön of *Cerebratulus lacteus* might have evolved in correlation with the thick egg-membrane characteristic of this species (Fig. 1, A).<sup>1</sup>

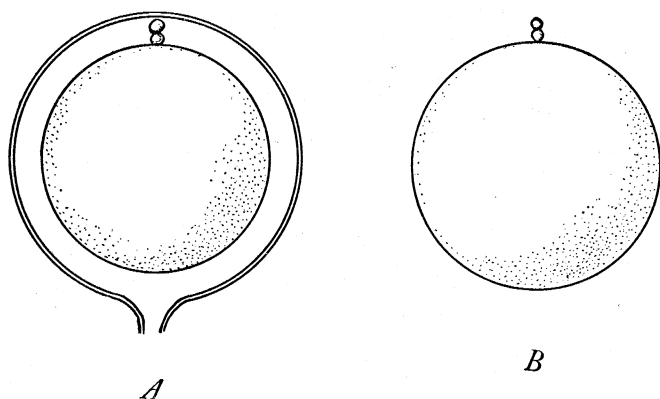


FIG. 1. Egg of *Cerebratulus lacteus*, (A), and of *C. marginatus* (B).  $\times 220$ .

Since the study of sections was begun this conclusion has been strengthened. The spermatid has a round head. Later the anterior portion of the head is gradually drawn out into a slender beak, the head proper still remaining pear-shaped. At the last stage of this transformation the beak thickens and the head proper elongates. Thus the typical shape of the sperm-head is attained (Fig. 2, A). After entering the egg, the sperm-head repeats in reversed order the process just described, finally giving rise to a

<sup>1</sup> The membrane is made up of two layers. By accident spermatozoa sometimes find their way into the space between them.

round sperm-nucleus, which does not differ much from that of the spermatid.

When informed by Professor E. B. Wilson that the egg of *Cerebratulus marginatus* has no membrane (Fig. 1, B), I thought that if the above conclusion were true, this species must have a spermatozoön with a blunt head. At Naples in the spring of 1906, I found that this expectation was fulfilled. Instead of the slender pointed head found in *Cerebratulus lacteus* ( $10.6\ \mu$ ), the Neapolitan form (*C. marginatus*) has a spermatozoön with a blunt head ( $5.4\ \mu$ ) terminating in a knob as shown in Fig. 2, B. The length of the tail is nearly the same in both forms.

The difference in size of the sperm-heads might be interpreted as due to the number of chromosomes contained in them. In fact *C. lacteus* has 18 or 19 chromosomes in the reduced number, while *C. marginatus* has 16 according to Coe.<sup>1</sup> Yet the difference in shape of the sperm-head between two such closely allied forms as these is difficult to explain without taking into consideration a special adaptation for boring thick membranes (cf. Pflüger and Smith, '83<sup>2</sup>). This, I think, is an actual instance to support the general belief that the diversity in the shape of sperm-head has evolved in response to the mechanical needs for penetrating the egg.

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NEW YORK, June 8, 1907.

<sup>1</sup> Coe, W. R., '99, "The Maturation and Fertilization of the Egg of *Cerebratulus*." *Zool. Jahrb. Abth. Anat. u. Ont.*, 12.

<sup>2</sup> Pflüger, E., und Smith, W. H., '83, "Untersuchungen über Bastardierung der anuren Batracier und die Principien der Zeugung." *Pflüger's Archiv*, 32.

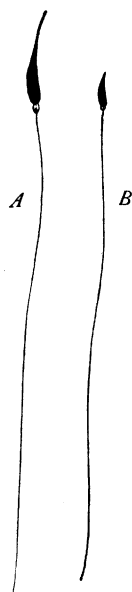


FIG. 2. Spermatozoön of *Cerebratulus lacteus* (A), and of *C. marginatus* (B).  $\times 1133$ .